

Remarks**I. Introduction**

In response to the pending Office Action, Applicants respectfully traverse the pending rejection for the reasons set forth below.

II. The Rejection Of The Claims Under 35 U.S.C. § 103

Claims 1-2, 4-6 and 8-9 stand rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,010,769 to Sasaoka. Applicants respectfully traverse the pending rejections for the following reasons.

The Examiner admits that Sasaoka does not expressly disclose the bonding strength between the wiring layers and the conductor is greater than the bonding strength between the wiring layers and the insulating base. The rejection is based on the premise that because the same materials are disclosed in Sasaoka as one of numerous possibilities, the same materials, if chosen, would satisfy the required bonding strength limitations. Applicants respectfully submit that this conclusion is clearly in error.

As recited by claim 1, and explained in the Applicants' previous response, the present invention relates to a circuit substrate having multiple wiring layers separated by an insulating layer, which have vias formed therein, and which are filled with conductive paste (i.e., conductor) in order to couple the wiring layers to one another. ***Importantly, the bonding strength between the wiring layer and the conductor is greater than the bonding strength between the wiring layer and the insulating layer.*** As a result, as explained in detail in the specification (e.g., *see* , pages 16 and 17), because of the foregoing relationship in bonding strength, when stress is caused by the difference in thermal expansion coefficients between the

insulating layer and the conductive paste, the interface between the wiring layer and the insulating layer serves to absorb the stress, thereby reducing the possibility of a disconnect between the conductive paste and the wiring layer.

Turning to the cited prior art and the pending rejection, first and most importantly, it is noted that the Sasaoka reference discloses a plurality of possible materials for the wiring layer, the conductive paste and the insulating layer (*see*, col. 15, lines 16-47, and col. 16, lines 37-57).

However, not every combination of the disclosed materials satisfy the foregoing limitation set forth in claim 1 regarding the respective bonding strengths. As such, practicing the device of Sasaoka does not necessarily result in practicing the present invention.

For example, referring to Fig. 5 of Sasaoka and the corresponding example, Sasaoka discloses a phenol resin-based conductive paste containing silver as a conductive filler which is utilized for the conductive pillar 14 (*see*, col. 21, lines 25-27), and an epoxy-based resin sheet of 70 μm which is utilized for the second insulating layer 11b (*see*, col. 21, lines 41-47). As a result of this structure, the bonding strength between the outermost via land 13a and the insulating layer 11b is greater than the bonding strength between the via land 13a and the conductive pillar 14. This is due to the fact that the insulating layer 11b is an epoxy-based resin, and the conductive pillar 14 is a combination of a silver filler and phenol resin. As the conductive pillar 14 contains silver filler therein, which does not bond to the via land 13a, the bonding strength between the conductive pillar and the via land 13a is less than that between the via land 13a and the insulating layer 11b, which includes only resin.

Furthermore, according to Sasaoka, an epoxy-based resin generally suitable as an adhesive is utilized for the insulating layer 11b, and a phenol resin generally used as an insulating agent is utilized for the conductive filler 14. As a result, in contrast to the present

invention, the bonding strength between the insulating layer 11b and the via land 13a is greater than that between the via land 13a and the conductive pillar 14, rather than the bonding strength between the wiring layers and the conductor being greater than that between the wiring layers and the insulating base, as recited by claim 1. It also does not result in having a tensile strength of said conductor being greater than the bonding strength between said insulating base on a wall surface of said conductor, as cited by claim 9.

Thus, the conclusion set forth in the Office Action and on which the present rejection is based (i.e., that practicing Sasaoka necessarily results in the present invention) is incorrect. Indeed, the opposite is true in that practicing the disclosed examples of Sasaoka results in a device which fails to satisfy the claimed invention. Accordingly, there is no basis or reason to conclude that the present invention is obvious in view of Sasaoka.

Moreover, where the prior art reference discloses numerous materials as candidates for each of the layers, as is the case with Sasaoka, a showing of obviousness is not readily accomplished. Indeed, as repeatedly held by the Federal Circuit, the fact that a claimed compound may have been encompassed by a prior art reference does not by itself render that compound obvious. *In re Jones*, 958 F.2d 347, 350, 21 USPQ2d 1941, 1943 (Fed. Cir. 1992). The CAFC in *In re Baird et al.*, 16 F.3d 380, 382-383, 29 USPQ2d 1550, 1552 (Fed. Cir. 1994) states:

“The generic diphenol formula disclosed in Knapp [reference] contains a large number of variables, and we estimate that it encompasses more than 100 million different diphenols, only one of which is bisphenol A. While the Knapp formula unquestionably encompasses bisphenol A when specific variables are chosen, there is nothing in the disclosure of Knapp suggesting that one should select such variables.”

In the instant case, the Sasaoka reference discloses a plurality of possible materials for the various layers. Specifically, the insulating layer of Sasaoka may include polycarbonate resin,

polysulfone resin, thermoplastic polyimide resin, polyethylene resin 4-fluoride, polyethylene resin 6-fluoride, and polyether etherketone resin, epoxy resin, bismaleimide triazine resin, polyimide resin, phenol resin, polyester resin, melamine resin butadiene rubber and butyl rubber, natural rubber, neoprene rubber, or silicone rubber. The conductor pillar of Sasaoka comprising conductive materials contains conductive powder such as silver, gold, copper, and solder powder and conductive resin where the resins for binder component include thermoplastic resins, polycarbonate resin, polysulfone resin, polyester resin, and phenoxy resin, and thermosetting resins such as phenolic resin, polyimide resin and epoxy resin, methyl methacrylate, diethylmethyl methacrylate, trimethylolpropane triacrylate, diethylene glycol diehyl acrylate, methyl acrylate, diethylene glycol ethoxylate acrylate, acrylate of caprolactopne modified dipentaerythritol.

Thus, the Sasaoka reference unquestionably encompasses thousands of permutations for the material selected for the insulating base, the conductor and the prepreg. However, there is nothing in the disclosure of Saosaka suggesting how one should select such variables. Indeed, as noted above, the example expressly set forth in Fig. 5 of Sasaoka fails to satisfy the claimed relationship.

Thus, it is respectfully submitted that the Applicants' claimed invention is not inherent in the teachings of Sasaoka. For all of the foregoing reasons, it is respectfully submitted that the pending claims 1 and 9 are patentably distinct over Sasaoka.

**III. All Dependent Claims Are Allowable Because The
Independent Claims From Which They Depend Are Allowable**

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1, 2 and 13 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also in condition for allowance.

Finally, it is noted that nowhere in the disclosure of Sasaoka does it disclose **a metal cohesion, a non-bonding region and a surface irregularity**, as currently recited by claims 5, 6 and 8, respectively. The Examiner is directed to **M.P.E.P § 2143.03** under the section entitled "All Claim Limitations Must Be Taught or Suggested", which sets forth the applicable standard:

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (citing *In re Royka*, 180 USPQ 580 (CCPA 1974)).

In the instant case, the pending rejection does not "establish *prima facie* obviousness of [the] claimed invention" as recited in claims 5, 6 and 8 because the proposed combination fails the "all the claim limitations" standard required under § 103. Fig. 1 of Sasaoka, as asserted by the Examiner, does not disclose any of the foregoing claimed subject matter.

IV. Request For Notice Of Allowance

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication for which is respectfully solicited.

If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

To the extent necessary, an additional petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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Date: May 26, 2004